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ABSTRACT

The final report describes a project to devise and field test methods of assessing short-term memory in deaf blind children. It is explained that four tests of short-term memory were devised (Body Touch - Sighted Version, Body Touch - Blind or Blindfolded Version, Removed Object Test, and Finger Touch Test) and field tested with 32 children (8-15 years old). Analysis is said to have indicated that all tests had content validity, and to have suggested that for deaf blind children there are few general or group factors that can be hypothesized to account for perceptual/cognitive functioning. The second part of the report contains details of the four tests and instructions for their construction and administration. (CL)

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MEMORY SPAN TESTS FOR THE DEAF-BLIND

ED175206

BY

M.J. TOBIN AND S.O. MYERS

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PREFACE AND ACKNOWLEDGEMENTS

This handbook and manual of instructions constitutes the final report to the Gardner's Trust for the Blind on a project financed by the Trust, the main aims of the investigation being the devising and validation of methods for assessing aspects of short-term memory capacity in children suffering from severe visual and hearing impairment. In submitting this report to the Trustees, we should like to place on record our gratitude to the Trustees for their generous support. In addition, we are pleased to have this opportunity to thank the Governors of Condover Hall School and its headmaster, Mr. A. Jarvis, for permitting us to carry out the long series of trials that are essential for the development of valid and reliable methods of assessment. Most of the development work was carried out in Pathways, the special unit at Condover which caters for the needs of children classified as deaf/blind or deaf/partially sighted. A special word of thanks is due to the teaching and child-care staff in the unit, and in particular to Miss Joan Shields, the teacher-in-charge; without their encouragement and active assistance, the work could not have been done. The children themselves deserve our warmest gratitude for their willing and cheerful co-operation; we can only hope that the instruments they helped us devise will be of value to their successors in the Unit and to deaf/blind children elsewhere.

Throughout the period of the investigation, we have been ably assisted by our colleagues, Mrs. E. Hill and Mrs. J. Whittaker, and we gladly acknowledge their help.

M.J. Tobin and S.O. Myers,
July, 1978.

SUMMARY

The general problems of defining, assessing, and educating deaf/blind children are discussed. Although no attempt is made at a comprehensive review of the existing research – scant though that it is – some reference is made to work relevant to the background of the present investigation. A 'justification' is then made for taking aspects of short-term memory functioning as the core or basis of the investigation. There is then a description of the subjects of the enquiry, the children educated at 'Pathways', the deaf/blind unit in Condover Hall School for Blind Children with Other Handicaps. An account is given of the measures of short-term memory capacity devised during the course of the project, and data are provided about the validity and reliability of these tests. The second part of the report comprises an instructional manual for the administration and scoring of the tests. It is claimed that none of them requires expensive materials or objects, and that all can be constructed quickly and easily from the illustrations and descriptions provided in the manual.

CONTENTS

Preface and Acknowledgments i

Summary ii

PART 1. BACKGROUND, RATIONALE, AND RESULTS

Definition 1

Assessment and Education 2

Present Investigation 4

Subjects 6

Test Instruments 7

Reliability 8

Validity 11

Conclusions 14

References 15

PART 2. MANUALS OF INSTRUCTIONS FOR TESTS

Body Touch Test - Sighted Version 17

Body Touch Test - Blind or Blindfolded Version 20

Removed Object Test 23

Finger Touch Test 27

Figs. 1 - 12 30

PART 1

BACKGROUND, RATIONALE, AND RESULTS

BACKGROUND, RATIONALE, AND RESULTS

Definition

Although there are standards, more or less precise, laid down for categorizing a child as deaf or blind, and even as hearing impaired or partially sighted, there is as yet no statutory, medical, or educational definition of the 'deaf/blind'. A short and useful description is that put forward by the Resolutions Committee of the Fifth International Deaf/Blind Seminar held at Condover Hall in 1974, viz:-

"Children are deaf/blind who have auditory and visual handicaps, the combination of which causes such severe communication and other developmental problems that they cannot properly be accommodated in special education programmes solely for the hearing handicapped child or for the visually handicapped child." (R.N.I.B. / I.C.E.V.H., p.119, 1976.)

The merit of this kind of definition lies in its apparent primary emphasis on the child's educational needs rather than with his physiological or neurological defects. By implication, however, it suggests there is a homogeneity of needs, and of methods of meeting those needs, that few experienced teachers and psychologists would be prepared to endorse. Something of the diversity to be found among the deaf/blind is brought out in the distinctions made by Jordan (1964) and Dinsmore (1967). In an effort to clarify the position, Jordan discriminated among those who are blind and then lose their hearing, those who are deaf and then lose their sight, and those people lacking hearing and sight from very early on in childhood. Dinsmore takes the analysis a little further, postulating five sub-groups:- those children who have verbal and visual memories as a result of having had several years of useful hearing and sight; those deaf from early childhood but who had useful vision for some time; those blind from early childhood but who had useful hearing for some time; those with combined visual and auditory impairment from very early on in infancy; and those with various combinations of partial impairments. These tries at 'un-packing' the concept of deaf/blindness are valuable in that they focus attention on the likely differences in the learning needs of children labelled as deaf/blind, but it is by no means a straightforward exercise in logic or pedagogy to derive from these categorisations the kinds of specific teaching/learning programmes appropriate to the children subsequently assigned to each group.

The problem of definition is seen to be just as difficult when account is taken of the aetiology rather than of the severity or timing of onset of the combined handicaps. The so-called 'rubella child', for example, with

massive damage in his central nervous system and with concomitant physical defects may present educational and social challenges qualitatively different from those associated with other causes of sensory impairment. In a follow-up study of former pupils of Condover Hall School, one of the authors (Myers, 1975) has referred to the fact that rubella infection "is responsible for the great majority of the children now described as deaf/blind..... (and that) successive epidemics in Britain have produced a total of approximately 400 children who are now of school age". He goes on to argue that the "label 'deaf/blind' is inaccurate and confusing. The new generation of 'deaf/blind' children would be better described as children with severe difficulties of communication associated with defects of vision and hearing and often with other handicaps including, for many children, severe intellectual impairment".

In spite of differences in emphasis and detail, these definitions have much in common and certainly enough to ensure identification of the children concerned with high 'inter-rater' agreement. Until more precise criteria are established, they will continue to serve as the pragmatic guidelines.

Assessment and Education

The initial assessment of deaf/blind children is usually made by paediatricians and ophthalmologists, with other medical specialists participating where necessary. From an educational standpoint, this 'diagnosis' of handicap is the administrative mechanism which routes the child into the 'special' rather than the 'normal' sector of the educational system. Unfortunately, it is rarely more than that. It all too often provides little or no information about what can be expected in visual or auditory terms since the indices of visual acuity and auditory loss are no more than rather crude markers of physiological functioning. In the United States, dis-satisfaction with the diagnostic and prescriptive value of this kind of assessment of the additionally-handicapped may be seen as one of the causal factors in the establishment of centres such as that at Syracuse University (see, for example, Root and Riley, 1960; Donlon, 1964; and Dinsmore, 1967). Despite the general welcome afforded to ventures of this nature, it is still the case in the U.K. that a multi-disciplinary approach to assessment is more of an aim than a reality. It is due in part to the fact that the child's gross physical, sensory, mental, and developmental

defects quite clearly de-bar him from education in his neighbourhood school and, in most instances, even in the special day or residential schools associated with his major handicap. The inevitability of his placement in one of the few schools or units that cater for the multiply-handicapped seems then to remove the necessity for a more detailed, wide-ranging examination of his existing skills and abilities with a view to drawing up a programme of locomotor, sensory, perceptual, cognitive, and social training. It will be argued, and with some force, that the procedures developed at, for example, Condover and Rushton (Myers, 1975), Lea Hospital (Leary and Simon in Part 1 of Tobin et al., 1972), Borocourt, and even more recently at the Wolfson Centre (Reynell and Zinkin, 1975) are multi-disciplinary in essence and programme-oriented in aim. With the exception, however, of the Pathways Unit at Condover, none of them has the needs of the deaf/blind as the prime focus of its attention, and their importance therefore, in this context, lies in what they have shown to be the advantages of a multi-disciplinary team and in their concern with developing assessment, observational, or therapeutic methods specially designed for additionally-handicapped blind children.

Warren (1977) has observed that "Much of the published work with deaf/blind children has centered on problems of language and communication." Although other aspects of their education have been touched on in the reports of the international seminars held under the auspices of the International Council for the Education of the Visually Handicapped, Warren's comment is undoubtedly true, as is his assertion that when "problems are discussed in other areas of development, such as socialization or interpersonal relations, they are often attributed to the primary deficits in communicative abilities" (op.cit., p.175). A rather different way of looking at the problem, however, is presented by Meshcheryakov (1966) who describes the Russian approach to 'compensating' for the effects of "blindness, deafness, and dumbness". It is conceived as a framework that starts with the child learning to manipulate his physical environment, and then moving on to the setting up of self-help habits, the development of 'signal' behaviour, and the achievement of the ultimate goal — the mastery of "verbal speech habits" that enable the child to "systematize his direct knowledge, i.e. the image of objects and actions, in accordance with the logic of the language". There have been some remarkable successes reported by the Russians but in most instances the subjects have been the so-called 'classical' deaf/blind, those adventitiously

handicapped by diseases such as meningitis in early childhood. The prognosis for those suffering from profound, congenital disability is generally thought to be less optimistic, with Eliosett (1971) arguing that a mental age of about 18 months is a pre-requisite for success in the acquisition of language in the deaf/blind child. This is a depressing conclusion, especially as so many of the rubella-affected children are below this developmental level.

This concern with language development is found also in the Dutch investigations by van Dijk and van Uden. van Dijk (1971) has suggested that there is a group of deaf/blind children whose difficulties in language are associated with problems in motor co-ordination (dyspraxia) and in ability to order actions and events rhythmically (dysrhythmia). van Uden (as reported by de Leuw (1976)) has looked at the language and other learning problems of deaf/blind children, using adaptations of existing tests of rhythmic movement, reproduction of drawings, paper-folding, gross and fine motor ability, oral fluency, lip-reading, etc. To perform at any measurable level on some of these tests pre-supposes a degree of visual and hearing competence found among some, but by no means all, deaf/blind children. As has already been said, the label 'deaf/blind' is used to cover a very wide range of combinations of disabilities, and the work of van Dijk and van Uden points to the heterogeneity of the group and, at the same time, to the value of searching for patterns and clusterings of factors that may eventually be shown to be linked in a causal relationship with specific kinds of malfunctioning.

Present Investigation

Most conventional tests of intelligence contain items that require the exercise of what is often called 'short-term memory'. They typically consist of sequences of digits or letters, but the content may take a variety of forms, all, however, requiring the subject to perceive, encode, store, recall, and reproduce the original information. Tasks like this have been built in to the tests devised by van Dijk and van Uden (see above) and into the video-tape evaluation system developed in the United States and described by Donlon and Curtis (1972). Among the claims made for including these tests of immediate memory in intelligence tests are that they provide data about the subject's ability to attend and concentrate and that they are, at least in children, correlated with what might be termed 'general intelligence'. There is, too, a developmental aspect since it has been found that memory span

increases steadily in step with age until early adolescence when it reaches its maximum. As regards the attention/concentration claim, there is a mass of research literature demonstrating how easy it is to impair encoding and recall by various kinds of distractions, and it might be expected therefore that the child with sensory deficits would be at a serious disadvantage. He is severely disabled by the inadequacy of his senses when it comes to the picking up and transmission of the data into his memory 'store', and he is liable to suffer interference from other internal and external stimuli during the relatively more extended period of time when he is re-transmitting the data. The attention/concentration capacity of the deaf/blind child is in that sense much more vulnerable to disruption. In his popular summary of what was then known about human memory, Hunter (1957) refers to the work in the nineteenth century of Jacobs and Galton whose findings about the positive, if moderate, correlation between general intellectual abilities and memory span have been regularly confirmed.

Evidence and arguments of this kind would constitute a sufficient justification in themselves for attempting to devise purpose-built measures of memory span in children whose sensory impairments make the usual vision and auditory tests inappropriate. Certainly the positive correlation with overall intellectual functioning would, in the current absence of any instrument for measuring such intelligence, be reason enough for welcoming the appearance of valid memory tests. A more potent reason however can be adduced: most human communication systems require some sort of temporal sequencing of the information. Speech puts phonemes and words into a time sequence; writing arranges graphemes and words in a spatial sequence which is perceived over time. These, and other, systems necessitate at the receiver's end the perception and storing, and then the integrating of the stored information into meaningful wholes. In all of them, there is the exercise of short-term memory processes. The demands on immediate memory are probably even greater in the various communication systems now in use with the deaf/blind. Finger-spelling may be done with great speed and fluency by the experts but it is inevitable that any system entailing the signalling of every letter by means of a physical movement and pressure will be relatively slow, and thus involve the 'receiver' in holding information in store until enough has been received to permit 'closure'; that is, recognition of the whole word or phrase. The capacity of the memory store will therefore be a significant factor in determining the child's

ability not only to master but to use such a code for transmitting and receiving messages. Superimposed upon his defective sensory system is a mode of communication that by its very nature will require intelligence, concentration, and maximal use of the available storage space in the user.

It was for these reasons that the current project took the form of an investigation aimed at devising and validating tests of immediate memory span. If successful, it was envisaged that the project would make available, for use by teachers and others specializing in the assessment and education of the deaf/blind, a set of instruments that could be easily constructed and administered; that would be of value as measures of concentration/attention; that would say something, however meagre and tentative, about the child's general intelligence; and that might be of some help in the choosing and planning of the communication methods best matched to the child's capacities and needs.

Subjects

The main group of 32 children participating in the investigation were those being educated on a residential basis at Pathways, the unit for deaf/blind children at Condover Hall School for Blind Children with Other Handicaps. There were 13 boys, and 19 girls; at the mid-point of project, their mean age was 11.85 years, S.D. 2.17 years (boys, mean age 11.69, S.D. 2.42; girls, mean age 11.95, S.D. 1.94), the total range being 8.0-15.0 years.

The measured visual acuities ranged upwards from perception of light to 6/9 (one child) on the Snellen chart. 55% of the group were classified as 6/36 or better; i.e. falling within what in Great Britain is generally regarded as the partially sighted category. 25% were between 4/60 and 3/24 inclusive and 20% had vision below 4/60. The records suggested that the ophthalmologists had refrained from recording the fields of vision owing to the unreliability of the children's reporting.

Tests of hearing showed that for 20% of the children, no response could be elicited for either ear; 60% had hearing losses of 80 decibels or more at the best frequency in the better ear; and 20% had losses of 35 decibels or more at the best frequency in the better ear.

20 had maternal rubella reported as the cause of the hearing and visual losses, and in all cases birth was given as the age of onset. Other additional handicaps recorded were cardiac murmur, mental retardation, and slight hydrocephalus.

Despite the severity of the handicapping conditions, senior staff in Pathways or formerly associated with the Unit described the group as probably falling within the top 10% of the mental ability range of deaf/blind children, although of course no objective means of measuring such ability is available for this population.

Test Instruments

Immediate memory span in normal children is usually assessed by oral or visual presentation of randomly ordered strings of letters or digits. The sensory handicaps of the group under investigation precluded the use of this kind of material. Nevertheless, many of the children had enough vision to discriminate among, and recognize, objects of common use at school and home and could also use their residual vision for monitoring finger and hand movements at two to three feet. It was decided therefore to devise tests that would allow use of these abilities but that could also be presented tactually where vision was too low or when it was desired to assess purely tactual functioning. The other criteria were ease of construction; ease of administration; and the need for the subjects to perceive, encode, store, recall, and reproduce the stimuli in the same order as presented, i.e. engage in tasks that on the face of it are similar to those involved in many of the conventional tests of immediate memory. The extent to which this last criterion has been met is discussed below under the heading 'Validity'.

During the course of the enquiry, the investigators devised various alternatives that had some 'face validity', that is, had the appearance of short-term memory tests. Some were discarded on account of difficulties encountered in trying to administer them and others because they did not reach acceptable levels of internal consistency or test/re-test reliability. Four untimed 'power' tests came through the long process of try-outs and modifications. All four eventually reached levels of internal consistency comparable with those expected of published psychological/educational measures of aptitude and achievement. They are:-

1. Body Touch - Sighted Version;
2. Body Touch - Blind or Blindfolded Version;
3. Removed Object Test;
4. Finger Touch Test.

Details of the tests and instructions for their construction/ administration are to be found in the second part of this report. It should be noted that Test 3 allows the child to use sight and touch together or touch alone if his residual vision is inadequate. The same is true of Test 4. Alternative touch and sighted versions of the Body Touch Test have been included.

Reliability

Table 1 provides information on the internal consistency of the tests. The tests in their final versions have two items at each span length. It was found that the multi-handicapped child's interest and attention could best be held if the smallest number of items followed the 'practice' part of the test session. However, the tests place increasingly greater demands on the child as longer spans of items are presented, and the individual items are therefore not of equal difficulty. Any single test is therefore not homogeneous in every respect. The 'two-item per span length' solution has made it possible, however, for each test to be split into two equal parts, one half comprising the odd-numbered items and the other half the even-numbered items. The internal consistency of the test could then be estimated by the special Spearman-Brown formula with n = 2, viz:

$$r_{tt} = \frac{2r_{hh}}{1+r_{hh}}$$

(Where r_{tt} is the reliability of the total test and r_{hh} is the reliability of the two half-length tests.)

Table 1. Memory Tests: Internal Consistency Co-efficients, and Means and Standard Deviations. Deaf/Blind Group.

	Internal Consistency Co-efficients	Mean Scores	Standard Deviations
1. Body Touch Test (Sighted Version)	0.909** N = 24	12.29 N = 24	6.67
2. Body Touch Test (Blind or Blindfolded Version)	0.947** N = 25	14.25 N = 24	9.06
3. Removed Object Test	0.927** N = 24	13.25 N = 24	9.62
4. Finger Touch Test	0.943** N = 25	11.41 N = 24	6.37

** Significant at 1% level.

N.B. For the purposes of estimating internal consistency, items were scored 1 or 0; for arriving at means and standard deviations, each item was weighted according to length of span (see Manual of Instructions in Part 2).

Although the final versions of the four tests reached very satisfactory levels of internal consistency, it could not be expected that the indices of reliability over time would be as high (see Table 2). The proportions of variances accounted for range upwards from 45% to 84%, with substantial amounts being attributable, therefore, to other undefined factors, This is a common enough phenomenon in educational and psychological testing, and those who are familiar with multi-handicapped children know in any case how widely they can vary over even quite short periods of time. That the deaf/blind are not unique in this respect is made clear by the reliability co-efficients obtained for two other groups of additionally-handicapped blind

children (none of whom had a significant hearing impairment). Even if a generous interpretation is put on the achieved levels of test/re-test reliabilities by readers who have experience of constructing assessment instruments for use with the handicapped, the authors would want to remind them that the obtained co-efficients inevitably conceal large variations in performance by some individuals from one test administration to the next. The very least that must be stressed is that no judgements leading to decisions about placement or teaching should be made solely on the basis of scores on one or more of the tests. In addition to all the other factors that would have to be considered, variation in test performance over successive administrations would need to be seen as of significance in itself.

Table 2. Memory Tests: Test/Re-test Reliability Co-efficients.

	Deaf/Blind Group	Additionally Handicapped Blind Group (but not Deaf)
1. Body Touch Test (Sighted Version)	One-week interval: 0.833** N = 23 Two-months interval: 0.672** N = 22	———
2. Body Touch Test (Blind or Blind-folded Version)	Two-months interval: 0.843** N = 25	———
3. Removed Object Test	Two-months interval: 0.746** N = 17	Group A One-month interval: 0.754** N = 11
		Group B Six-weeks interval: 0.881** N = 17
4. Finger Touch Test	One-month interval: 0.915** N = 21	———

** Signifant at 1% level.

With the small numbers of children involved no table of 'norms' can be drawn up. It has not proved feasible to do other than provide information about the central values (mean scores) and the variabilities (standard deviations) of the group on the various tests. It is hoped that users will let the authors have details of scores obtained on the tests to permit the compilation of more accurate and reliable statistics. For this purpose, copies of the score sheets would be most useful. In the meantime, interpretation of scores can be made in part by reference to Table 1 but users will know that their own clinical experience and judgement exercised as a result of direct observation of a child's performance must be the principal criteria in these situations.

Validity

On the face of it, the tests all have 'content validity': as in conventional digit and letter span tests, the subjects are having to perceive and store a strong of unrelated stimuli and then reproduce them in the same order. Some tentative corroboration of the claim may be found in the significant correlation between digit span and Removed Object Test scores of a group of 18 additionally handicapped (but not deaf) blind children in Condover Hall School (see Table 3A). However, the correlation co-efficient of 0.652 indicates that, even for this group, only some 43% of the variance in the digit span test is accounted for by the Removed Object Test.

Table 3B shows too that for the deaf/blind group itself, the tests are either measuring rather different aspects of such memory or that the internal coding and retrieval of the information differ according to the nature of the material and/or the sensory modality primarily involved. Whatever the explanation, the low, even if statistically significant, inter-correlations shown in Table 3B suggest that the tests differ to some extent in the demands they make on the subjects. The Removed Object Test (in which the children used their residual vision) seems to be distinct in that it is not related to either of the two tests that have very large 'tactual' elements in them, viz. the Finger Touch and Body Touch (Blind or Blindfolded Version) Tests. Indeed, none of the tests accounts for more than 54% of the variance in any of the others. Correlations with intelligence, as assessed by staff ratings, are also low.

Three of the tests were administered to 39 deaf children - none with a visual handicap - and it can be seen from Table 3C that all three were significantly inter-correlated.

A tentative explanation is offered. It may be that, for deaf/blind children, there are few general or group factors that can be hypothesized to account for perceptual/cognitive functioning. In that case, a corollary would be that their gross sensory impairment is associated with a high degree of specificity in functioning. Such an explanation would accord with one's informal observation of their behaviour. If well-founded, it underlines the importance of extended and careful assessment of an individual child to ensure that his specific perceptual and cognitive 'styles' are identified, and then used for teaching and learning purposes.

Table 3. Validity Data Co-efficients

A. Additionally Handicapped (not Deaf) Blind Children. N = 18.

Digit Span / Removed Object Test: 0.652**

B. Deaf/Blind Children. N = 24.

	1 Body Touch Test (Sighted Version)	2 Body Touch Test (Blind or Blindfolded Version)	3 Removed Object Test	4 Finger Touch Test	5 Intelligence
1. Body Touch Test (Sighted Version)	1.000	0.403*	0.677**	0.726** (N=18)	0.442*
2. Body Touch Test (Blind or Blind-folded Version)		1.000	0.240	0.735** (N=23)	0.443*
3. Removed Object Test				0.037 (N=21)	0.258
4. Finger Touch Test				1.000	0.737** (N=17)

C. Deaf (<u>not</u> Visually Handicapped) Children. N = 39.

	1 Body Touch Test (Sighted Version)	2 Body Touch Test (Blind or Blind-folded Version)	3 Removed Object Test
1. Body Touch Test (Sighted Version)	1.000	0.590**	0.632**
2. Body Touch Test (Blind or Blind-folded Version)		1.000	0.438**
3. Removed Object Test			1.(0

** Significant at 1% level.

* Significant at 5% level.

Conclusions

The tests in their present form may be seen as affording opportunities for the systematic observation of deaf/blind children. In the long term, they will need to be supplemented by other objective methods, especially if the explanation offered above as to the specificity and sharply differentiated nature of perceptual/cognitive functioning in the deaf/blind is later substantiated. The usual call for 'further research' must be made. Our understanding of these children is almost entirely based on the experience of parents, teachers, and other child-care staff. Valuable though this is, it needs to be verified and extended by means of objective investigations. However, a programme of research can not easily be drawn up for a group that is in absolute terms very small in number and which at the same time is so heterogeneous — aetiologically and functionally. Perhaps the only worthwhile model for such a programme would be an idiographic one; that is, a model in which the focus of interest is the individual child rather than the group. The investigator's search for explanation and prediction would start with detailed and intensive observation of each child, and this would be followed by the development of procedures designed to modify specific aspects of behaviour. The success or failure of the procedures may have an explanatory potential for these children not found in the more traditional, group-based research methodology with its emphasis on the discovery of 'general' laws and theories.

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BODY TOUCH TEST — SIGHTED VERSION. PROCEDURE AND INSTRUCTIONS

Introduction

This version of the Body Touch Test is suitable only for partially sighted children or those blind children who have sufficient residual vision to be able to follow the movement of the tester's hand and arm at about two and a half feet and clearly perceive, and discriminate between, his head, nose, and chin at that distance. The child has to copy, on his own body, the tester's movements in the same order. It is essential that the tester have an assistant whose job it is to hold the child's hands still until the copying response is required and then to record the response on the score sheet.

To facilitate speedy administration of the test, it is desirable to have a display board listing the test items (see Fig. 11), the board being hung or placed behind the child out of his sight but in full view of the tester.

Procedure

1. This 14-item test is administered with the child and the tester sitting facing each other (see Fig. 1). The child should have his back to the major light source so that he can see the tester clearly. All gestures should be made rhythmically with long, sweeping movements to ensure that the child can visually follow the hand/arm movement and easily identify the part of the tester's body which is being touched. Each movement and its touch should therefore take about one second to complete.

2. The tester's hand should be slightly cupped and his fingers kept almost in line (see Fig. 2), all four of them making simultaneous contact with his own body.

3. At the end of each item of the test, the tester should place his own arms and hands by his side, preferably grasping the sides of the chair so that the child can clearly see the beginning and end of each item.

4. The eight parts of the tester's body that are touched are the top of the head, the nose, chin, chest, fore-arm, hand, knee, and foot (see Figs. 3 to 10). Precision and accuracy are not called for from the child and a fair degree of latitude is therefore allowed for scoring purposes. Some indication of the tolerance limits is shown in Figs. 3 to 10 but the tester must interpret

PART 2

MANUALS OF INSTRUCTIONS FOR TESTS

these in the light of the child's other handicaps. What is being tested is the child's ability to perceive, store, recall, and imitate the movements in correct order, and not his fine motoric control.

5. No visual or verbal indication of the correctness of a response should be given, other than a "you are doing well" or a "thumbs up" sign at the end of each completed item.

6. The tester's assistant should sit by the child's side so that he can (a) record the responses on the score sheet and (b) hold the child's hands down, gently but firmly, on the child's lap. He releases the child's hands when the tester has presented the complete item, and this 'release' is the signal for the child to respond.

N.B. In the four practice items, the 'release' should consist of a firm pushing of the child's preferred hand towards the correct part of the body. In the main test, the 'release' should be no more than a letting go and must give no indication of the correct direction of movement.

7. The test items or sequences are arranged in increasing order of difficulty, and testing should cease when both items of a given length have been failed.

Scoring

The score for each test item is the number of 'touches' in that item, i.e. each of the two-span items counts as two marks, each of the three-span items as three marks, and so on. The mark is awarded only if all the correct touches are made in the correct order. The maximum score is 70.

BODY TOUCH TEST — SIGHTED VERSION. SCORE SHEET

Child's Name_____ Date of Birth_____ Date of Test_____

School_____

Visual Acuity (best, corrected vision)_____

Degree of Hearing Loss_____

Favoured Hand (underline): Left / Right

Practice Items

		Score
(i)	CHEST	____
(ii)	HEAD - KNEE	____
(iii)	CHIN - ARM	____
(iv)	KNEE	____

Main Test

		Score
Item 1.	CHEST - KNEE	____
Item 2.	CHIN - ARM	____
Item 3.	ARM - CHEST - HEAD	____
Item 4.	KNEE - CHIN - CHEST	____
Item 5.	HEAD - CHEST - KNEE - CHIN	____
Item 6.	CHIN - ARM - CHEST - KNEE	____
Item 7.	ARM - CHEST - KNEE - HEAD - CHIN	____
Item 8.	CHEST - HEAD - ARM - CHIN - KNEE	____
Item 9.	NOSE - CHIN - CHEST - KNEE - HEAD - ARM	____
Item 10.	KNEE - ARM - CHIN - NOSE - HEAD - CHEST	____
Item 11.	HAND - KNEE - CHIN - CHEST - HEAD - NOSE - ARM	____
Item 12.	KNEE - CHEST - NOSE - ARM - HAND - CHIN - HEAD	____
Item 13.	FOOT - HEAD - CHEST - ARM - HAND - CHIN - KNEE - NOSE ..	____
Item 14.	HEAD - NOSE - CHEST - KNEE - FOOT - ARM - CHIN - HAND ..	____

TOTAL SCORE ☐

Maximum Score 70

BODY TOUCH TEST — BLIND OR BLINDFOLDED VERSION.

PROCEDURE AND INSTRUCTIONS

Introduction

This version of the Body Touch Test is suitable for those children whose sight is too impaired for them to be able to cope with the parallel 'Sighted Version'. It can also be used, when considered likely to be informative, with children with higher levels of visual acuity; in these cases, the children would close their eyes, wear eye masks, or be 'blindfolded' in some other way that is comfortable and acceptable to them. The tester touches various parts of the children's body as indicated on the score sheet, and the child is then required to copy this pattern of touches, also on his own body. It is recommended that the tester work with an assistant whose job it is to hold the child's hands still until the copying response is required and to record the response on the score sheet.

To facilitate speedy administration of the test, it is desirable to have a display board listing the test items (see Fig. 11), the board being hung or placed in full view of the tester.

Procedure

1. This 14-item test is administered with the child and the tester sitting facing each other (see Fig. 1), the tester being within easy arm-reach of the child.

2. The tester's hand should be slightly cupped and his fingers kept almost in line (see Fig. 2), with all of them making firm, simultaneous contact with the appropriate part of the child's body. Each movement and touch should take about one second to complete.

3. The eight parts of the child's body that are touched are the top of the head, the nose, chin, chest, fore-arm, hand, knee, and foot (see Figs. 3 to 10). Precision and accuracy are not called for from the child and a fair degree of latitude is therefore allowed for scoring purposes. Some indication of the tolerance limits are shown in Figs. 3 to 10 but the tester must interpret these in the light of the child's other handicaps. What is being tested is the child's ability to perceive, store, and recall, and imitate the touches in correct order, and not his fine motoric control.

4. No indication of the correctness of a response should be given, other than an appropriate "You are doing well" sign at the end of each completed item. For some children, this may consist of a congratulatory squeeze of the hand from the tester's assistant; for those with an adequate level of hearing, a spoken "Well done" will be sufficient.

5. The tester's assistant should sit by the child's side so that he can (a) record the responses on the score sheet and (b) hold the child's hands down, gently but firmly, on the child's lap. He releases the child's hands when the tester has presented the complete item, and this 'release' is the signal for the child to respond.

N.B. In the four practice items, the 'release' should consist of a firm pushing of the child's preferred hand towards the correct part of the body. In the main test, the 'release' should be no more than a letting go and must give no indication of the correct direction of movement.

6. The test items or sequences are arranged in increasing order of difficulty and testing should cease when both items of a given length have been failed.

Scoring

The score for each test item is the number of 'touches' in that item, i.e. each of the two-span items counts as two marks, each of the three-span items as three marks, and so on. The mark is awarded only if all the correct touches are made in the correct order. The maximum score is 70.

BODY TOUCH TEST – BLIND OR BLINDFOLDED VERSION. SCORE SHEET

Child's Name_____ Date of Birth_____ Date of Test_____

School_____

Visual Acuity (best, corrected vision)_____

Degree of Hearing Loss_____

Favoured Hand (underline): Left / Right

Practice Items

		Score
(i)	CHEST	____
(ii)	HEAD - KNEE	____
(iii)	CHIN - ARM	____
(iv)	KNEE	____

Main Test

		Score
Item 1.	CHEST - KNEE	____
Item 2.	CHIN - ARM	____
Item 3.	ARM - CHEST - HEAD	____
Item 4.	KNEE - CHIN - CHEST	____
Item 5.	HEAD - CHEST - KNEE - CHIN	____
Item 6.	CHIN - ARM - CHEST - KNEE	____
Item 7.	ARM - CHEST - KNEE - HEAD - CHIN	____
Item 8.	CHEST - HEAD - ARM - CHIN - KNEE	____
Item 9.	NOSE - CHIN - CHEST - KNEE - HEAD - ARM	____
Item 10.	KNEE - ARM - CHIN - NOSE - HEAD - CHEST	____
Item 11.	HAND - KNEE - CHIN - CHEST - HEAD - NOSE - ARM	____
Item 12.	KNEE - CHEST - NOSE - ARM - HAND - CHIN - HEAD	____
Item 13.	FOOT - HEAD - CHEST - ARM - HAND - CHIN - KNEE - NOSE ..	____
Item 14.	HEAD - NOSE - CHEST - KNEE - FOOT - ARM - CHIN - HAND ..	____

TOTAL SCORE ☐

Maximum Score 70

REMOVED OBJECT TEST. PROCEDURE AND INSTRUCTIONS

Introduction

In this test, the child is required to recall the names and positions of objects, which he has previously seen and/or felt, in an array of shallow containers placed in a row in front of him. The tester sits or stands facing the child, with a table between the two of them. It is recommended that the tester should always work with an assistant who sits on the same side of the table as the child. The assistant's main role is to record the child's responses on the score sheet and to raise and lower the cardboard occluder which is used to hide the test objects from those children with useful residual vision while the tester is putting the objects in position.

The main test items or sequences are arranged in increasing order of length, with two items at each stage. The second item at each stage has been carefully devised so that there is little likelihood that an association set up between successive objects in the first item will interfere with, or facilitate, the recall of the order of objects in the second item.

Materials

The objects have been chosen on the basis of availability, familiarity, and ease of manipulation; account has also been taken of the fact that all of them can be readily labelled by non-speaking children by means of formal signs or informal miming gestures.

The containers should measure approximately 7" by 5" and be no more than 1" deep. They can be made of cardboard, wood, or any other suitable material, Those used in the original field trials were tin-foil containers of the kind used for storing food in refrigerators and deep-freeze units, and the bottom was covered with one of the commercially-available adhesive fabrics, coloured matt black to provide a strongly contrasting background for the objects and to reduce glare. The test objects (comb, toothbrush, toy, car, etc.) should be chosen so that they are small enough to fit into the containers.

To facilitate the setting up and administering of each test item or sequence, it is suggested that a display board listing the items be prepared (see Fig. 11) and hung or placed behind the child out of his sight but in full view of the tester.

Procedure: Practice Items

1. Give the child the ten objects, one at a time, and ask him to 'name' each in turn. The naming can be a spoken word, a formal sign, or an informal gesture. Any informal gesture is acceptable as long as the tester and the child agree upon it and can recognise it consistently (e.g. a brushing, combing movement to represent the comb). This period of establishing of rapport should proceed as briskly or as slowly as the tester judges appropriate. It is important to ensure that the child enters happily and confidently into the activity and that an unambiguous communication code be set up.

[Even with the most retarded children who can not identify all ten objects, the test can be used in a shortened or modified form as part of an initial screening procedure or just to determine whether they have developed any ability to attach names to objects.]

2. Place one empty container on the table in front of the child. Draw his attention to it by pointing (if he has enough sight to follow such a gesture) or by putting his hand on and in it if his vision is inadequate. Place the CAR in the container after the assistant has raised the cardboard occluder. Have the occluder lowered, draw the child's attention to the container by pointing to it or by placing his hand in it, and 'ask' him to name the missing object. If the child fails, repeat the procedure with the COMB, and if necessary with the SPOON. If all three items are failed, abandon the test; however, as soon as one missing object is identified, proceed to Section 3.

3. Add a second container, allowing the child to see or feel you doing this. Use the pairs of objects set out in the practice section of the score sheet, and on this one occasion only, have the child help you put them in the two containers. Now try to establish a consistent, rhythmic routine: point to each object and ask the child to name it. Allow about two second per object, always moving from the child's left to his right. The occluder should now be raised, the objects removed, and the occluder lowered again. Point to each of the empty containers at about the same speed as at the presentation, asking the child to name each missing object before pointing to the next container. If the two items are correctly identified, move straight on to the main test. If all three items are failed, abandon the testing.

Procedure: Main Test

1. Raise the occluder, place the objects for Item 1 in the containers, lower the occluder, draw the child's attention to each object, and have him name it, allowing about two seconds per object; raise the occluder, remove the objects, lower the occluder, point to each empty container in turn, and ask the child to identify the missing object.

2. Present each test item in turn and terminate the test when both items of a given length are failed.

Scoring

The score for each test item is the number of objects in that item, i.e. each of the two-span items counts as two marks, each of the three-span items as three marks, and so on. The mark is awarded only if all the objects are recalled in the correct order. The maximum score is 50.

REMOVED OBJECT TEST. SCORE SHEET

Child's Name_____ Date of Birth_____ Date of Test_____

School_____

Visual Acuity (best, corrected vision)_____

Degree of Hearing Loss_____

Number of Objects Clearly Identified_____

Methods of Identification (underline): Sight / Touch / Both

Using (underline): Speech / Formal Sign / Gesture

Practice Items

		Score
(i)	CAR	____
(ii)	COMB	____
(iii)	SPOON	____
(iv)	BALL - SCISSORS	____
(v)	CUP - KEY	____
(vi)	BRICK - TOOTHBRUSH	____

Main Test

		Score
Item 1.	KNIFE - COMB - CUP	____
Item 2.	SPOON - SCISSORS - CAR	____
Item 3.	BRICK - TOOTHBRUSH - BALL - KEY	____
Item 4.	COMB - KEY - KNIFE - CUP	____
Item 5.	CAR - SCISSORS - SPOON - CUP - COMB	____
Item 6.	BALL - TOOTHBRUSH - KEY - KNIFE - BRICK	____
Item 7.	KNIFE - KEY - BALL - TOOTHBRUSH - BRICK - SCISSORS	____
Item 8.	CUP - TOOTHBRUSH - SPOON - COMB - BALL - CAR	____
Item 9.	SPOON - CAR - COMB - CUP - TOOTHBRUSH - SCISSORS - KEY ..	____
Item 10.	BRICK - BALL - SCISSORS - TOOTHBRUSH - CAR - KNIFE - SPOON	____

TOTAL SCORE [ ]

Maximum Score 50

FINGER TOUCH TEST. PROCEDURE AND INSTRUCTIONS

Introduction

This 14-item test is designed for children with a level of residual vision sufficient to enable them to monitor their own hand movements at whatever distance they find necessary or comfortable. The tester touches the child's fingers with his index finger and the child is required to repeat the same pattern of touching. Since the purpose of the test is to ascertain the child's ability to perceive, store, recall, and repeat the actions of the tester, and not to elicit information about level of motoric precision and dexterity, a fair degree of latitude is permitted for scoring purposes; that is, as long as the child has touched the correct finger, he is credited with success. The tester will therefore exercise his own judgement as to the acceptability of a response, taking into account any additional handicaps the child may have, or any other factors that may seem relevant.

It is recommended that the tester works with an assistant whose job it is (a) to record the child's responses on the score sheet and (b) to hold the hand the child will point with until the sequence of touches is completed and it is time for the child to respond.

Procedure: Practice Items

1. The tester's assistant sits by the child, on the side of the child's preferred/favoured/dominant hand. The tester can sit on the other side of the child or facing him.

2. The tester places the child's non-preferred hand palm down, fingers spread open, on a chair, table, or on the child's lap while his assistant holds the dominant hand.

3. The tester touches the child's THUMB gently but firmly. The assistant immediately releases the dominant hand and puts the index finger of that hand on the THUMB touched by the tester. The 'release' is the signal for the child to respond. The same procedure is followed for the other practice items, i.e. the SECOND, the THIRD and FIRST, and the FOURTH and SECOND fingers. The touches should be at the rate of one per second. The practice items can be repeated until it is clear that the child understands what he is required to do.

4. No visual or verbal indication of the correctness of a response should be given during the course of the child's response, but a "You are doing well" or a "Thumbs up" sign may be given at the end of each completed item.

Procedure and Scoring: Main Test

1. Having established the basic procedure, the tester should move on to the main test, presenting each test item or sequence in turn and terminating the session when both items at a given level are failed.

2. The score for each test item is the number of 'touches' in that item, i.e. each of the single-span items counts as one mark, each of the two-span items as two marks, and so on. The mark is awarded only if all the correct touches are made in the correct order. The maximum score is 56.

FINGER TOUCH TEST. SCORE SHEET

Child's Name_____ Date of Birth_____ Date of Test_____

School_____

Visual Acuity (best, corrected vision)_____

Degree of Hearing Loss_____

Favoured Hand (underline): Left / Right

Practice Items

		Score
(i)	T	____
(ii)	2	____
(iii)	3, 1	____
(iv)	4, 2	____

Main Test

		Score
Item 1.	4	____
Item 2.	1	____
Item 3.	T, 3	____
Item 4.	2, 4	____
Item 5.	1, T, 3	____
Item 6.	4, 1, 4	____
Item 7.	T, 2, 2, 3	____
Item 8.	4, 1, 3, 3	____
Item 9.	T, 4, 4, 2, 1	____
Item 10.	3, 1, 2, 2, T	____
Item 11.	4, 3, T, 1, T, 3	____
Item 12.	T, 1, 2, T, 4, 1	____
Item 13.	2, 2, 4, T, 1, 1, T	____
Item 14.	T, 4, 2, T, T, 1, 3	____

TOTAL SCORE ☐

Maximum Score 56

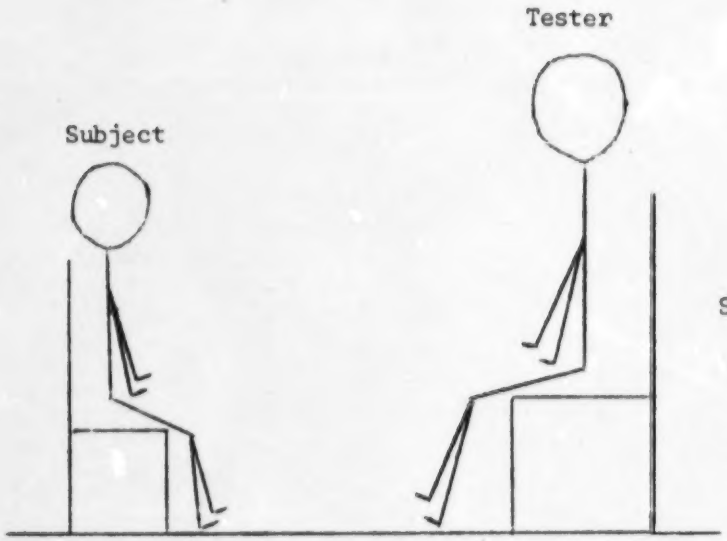

Fig. 1. Seating Plan

Fig. 2. Hand

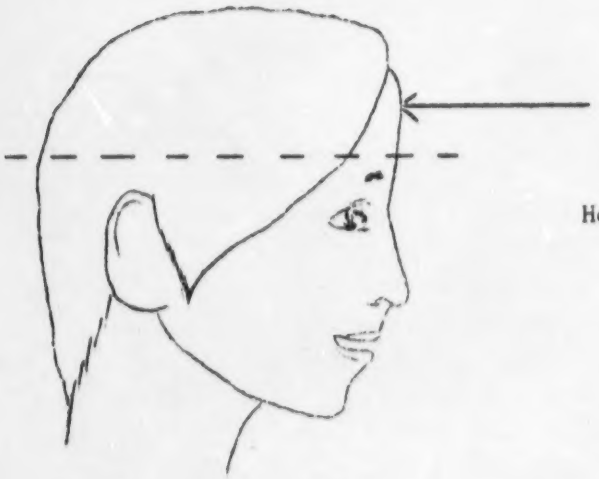

Fig. 3. Head

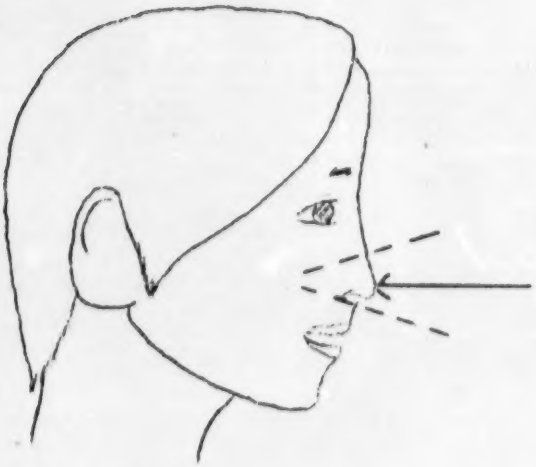

Fig. 4. Nose

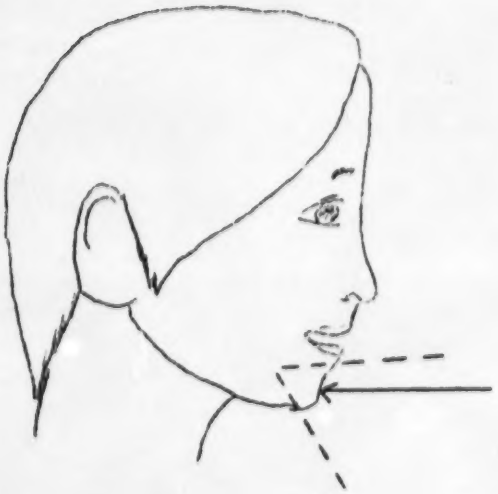

Fig. 8. Chin

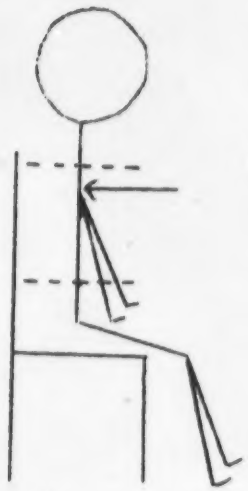

Fig. 6. Chest

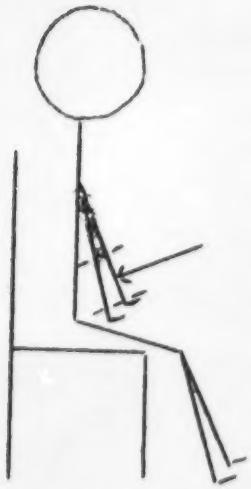

Fig. 7. Forearm

Fig. 8. Hand

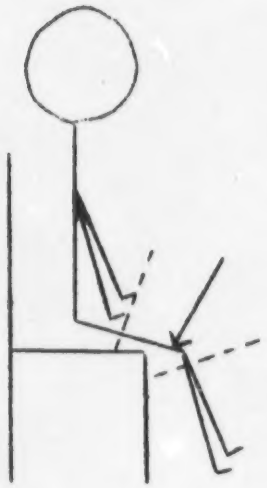

Fig. 9. Knee

Fig. 10. Foot

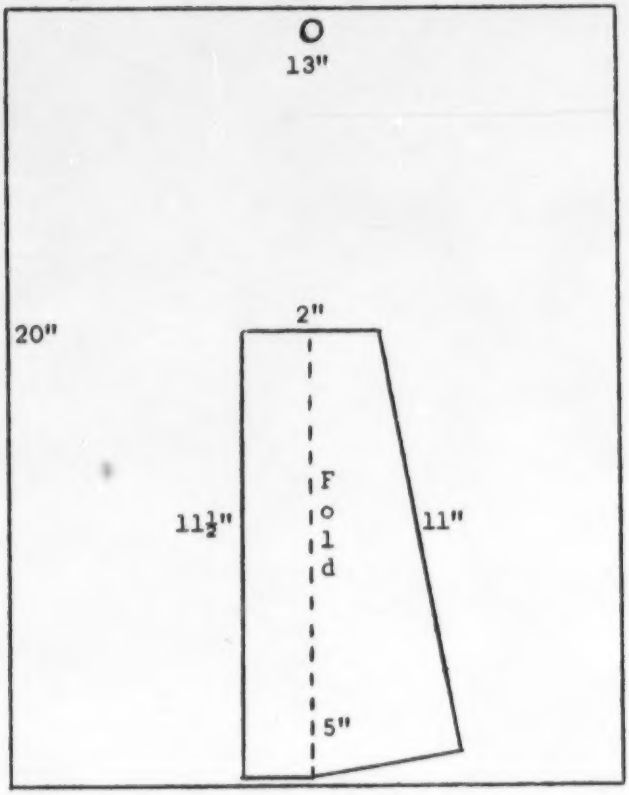

Fig. 11.'

Reverse of Display Board

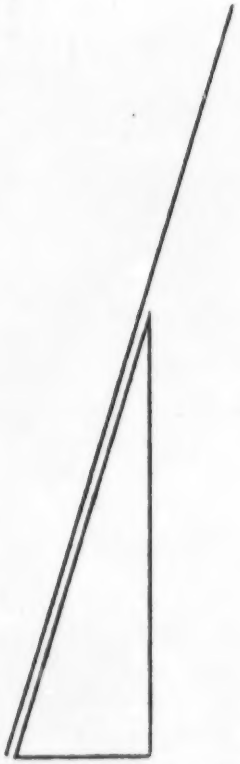

Fig. 12.

Side-view of Display Board